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TITLE: Breast Cancer Prevention by Inducing Apoptosis in DCIS  
Using Breast Ductal Lavage

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13. ABSTRACT (Maximum 200 Words)

Although great strides have been made in breast cancer screening and treatment, it remains the second highest cause of cancer-related deaths for women in the United States. Current prevention focuses on oral administration of tamoxifen which decreases breast cancer incidence but increases the risk for secondary uterine cancer. In addition, tamoxifen may not be effective in preventing those lesions that are estrogen receptor (ER) negative based on its primary function of suppressing cell proliferation by blocking the estrogen receptor. We hypothesize that programmed cell death is dysregulated in premalignant and malignant breast cells which permits both ER-positive and ER-negative cells to avoid cell death. We intend to investigate whether treating premalignant breast cells with a molecular genetic-based agent may be effective alone or in concert with tamoxifen treatment to induce cell death in both ER-positive and ER-negative cells. Ultimately, we envision delivering genetic-based preventive agents and/or tamoxifen directly to the breast ductal lobe of these high risk individuals thus eliminating any potential for tamoxifen-induced uterine cancers.

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Chemoprevention, apoptosis, breast ductal lavage, ductal carcinoma in situ, bcl-2 gene family, gene therapy, transfection

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**TITLE:**

Breast Cancer Prevention by Inducing Apoptosis in DCIS Using Breast Ductal Lavage

**INTRODUCTION:**

Although great strides have been made in breast cancer screening and treatment, it remains the second highest cause of cancer-related deaths for women in the United States. Current prevention has focused on oral administration of tamoxifen which appears to decrease breast cancer incidence but increases the risk for secondary uterine cancer. In addition, tamoxifen may not be effective in preventing those lesions that are estrogen receptor (ER) negative based on its primary function of suppressing cell proliferation by blocking the estrogen receptor. We hypothesize that programmed cell death (PCD) is dysregulated in premalignant and malignant breast cells which permits both ER-positive and ER-negative cells to avoid cell death. We intend to investigate whether treating premalignant breast cells with a molecular genetic-based agent (antisense bcl-2/bcl-xL oligonucleotide) may be effective alone or in concert with tamoxifen treatment to induce cell death in both ER-positive and ER-negative cells. Ultimately, we envision using the newly developed technique of breast ductal lavage to not only screen women for increased risk in developing breast cancer, which is currently being performed, but to also use this technique to deliver genetic-based preventive agents and/or tamoxifen directly to the breast ductal lobe of these high risk individuals thus eliminating any potential for tamoxifen-induced uterine cancers.

**BODY:**

The following is the approved Statement of Work for the project entitled "*Breast Cancer Prevention by Inducing Apoptosis in DCIS Using Breast Ductal Lavage*." When the Award was granted, the terms indicated that no patient samples could be obtained until the DoD's Human Subject Protection Office approved this project for the Use of Human Anatomical Substances. This still has not occurred, even though, this project received IRB approval on October 14, 2002 from the institution (Magee Womens Hospital, Pittsburgh PA) for which the samples are to be obtained. The documentation requested by the Human Subject Protection Office was sent to Ms. Catherine Smith on October 21, 2002 then transferred to Ms. Robin Dillner on November 5, 2002 but no decision on approval status was ever given. On April 1, 2003 I moved my researched laboratory from the University of Pittsburgh, Pittsburgh PA (who only released the funds for this project on August 13, 2003) to Wake Forest University School of Medicine, Winston-Salem NC. Since being here, I submitted (August 18, 2003) a modification of my IRB approved protocol at Magee Womens Hospital, Pittsburgh PA to send any future patient samples to my research laboratory at Wake Forest University School of Medicine. It has been approved but some clarifications need to be addressed by October 13, 2003. Although I have submitted an IRB application for review by the IRB at Wake Forest University School of Medicine, they are waiting for Magee Womens Hospital's IRB approval prior to approving at Wake Forest. Ms. Dillner indicated on September 16, 2003 that she would not be able to review the protocol that was initially sent and I would need to resubmit an application to the DoD's Human Subject Protection Office which

needs to include Wake Forest University School of Medicine IRB approval letter. Therefore, I remain without DoD's Human Subject Protection Office's approval for this project for the Use of Human Anatomical Substances and can not perform any research until I receive such approval as indicated on the terms of the subject award.

### **Statement of Work**

*Task 1.* Determine expression pattern of the PCD regulatory genes bcl-2, bax, and bcl-xL in primary DCIS cultures (Months 1-6):

- a. Protein analysis of Bcl-2, Bax, and Bcl-xL using Western blotting and immunohistochemical staining.

*Task 2.* Determine whether down-regulation by genetic manipulation of the anti-apoptotic genes bcl-2 and/or bcl-xL alone or in conjunction with physiological preventive doses of tamoxifen has the highest induction of PCD in primary DCIS cell cultures (Months 6-18):

- a. Treatment with antisense and control oligonucleotides and/or tamoxifen.
- b. Protein analysis of Bcl-2, Bax, and Bcl-xL using Western blotting and immunohistochemical staining.
- c. Quantify mRNA for bcl-2 or bcl-xL using a PCR-based assay.
- d. Determine effect of treatment on programmed cell death markers using assays for DNA fragmentation and caspase activation.

*Task 3.* Determine expression pattern of the PCD regulatory genes bcl-2, bax, and bcl-xL in cells obtained by breast ductal lavage (Months 18-24):

- a. Protein analysis of Bcl-2, Bax, and Bcl-xL using Western blotting and immunohistochemical staining.

*Task 4.* Determine whether down-regulation by genetic manipulation of the anti-apoptotic genes bcl-2 and/or bcl-xL alone or in conjunction with physiological preventive doses of tamoxifen has the highest induction of PCD in cells from breast ductal lavages (Months 24-36).

- a. Treatment with antisense and control oligonucleotides and/or tamoxifen.
- b. Protein analysis of Bcl-2, Bax, and Bcl-xL using Western blotting and immunohistochemical staining.
- c. Quantify mRNA for bcl-2 or bcl-xL using a PCR-based assay.
- d. Determine effect of treatment on programmed cell death markers using assays for DNA fragmentation and caspase activation.

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**KEY RESEARCH ACCOMPLISHMENTS:** N/A

**REPORTABLE OUTCOMES:** N/A

**CONCLUSIONS:** N/A

**REFERENCES:** N/A

**APPENDICES:** N/A